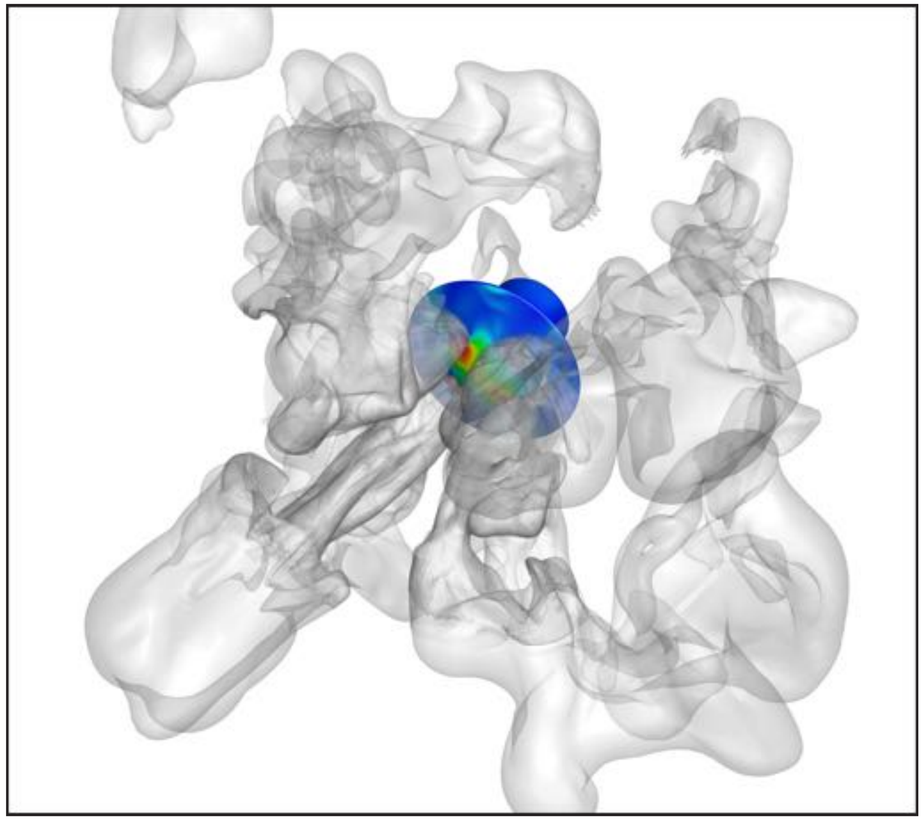
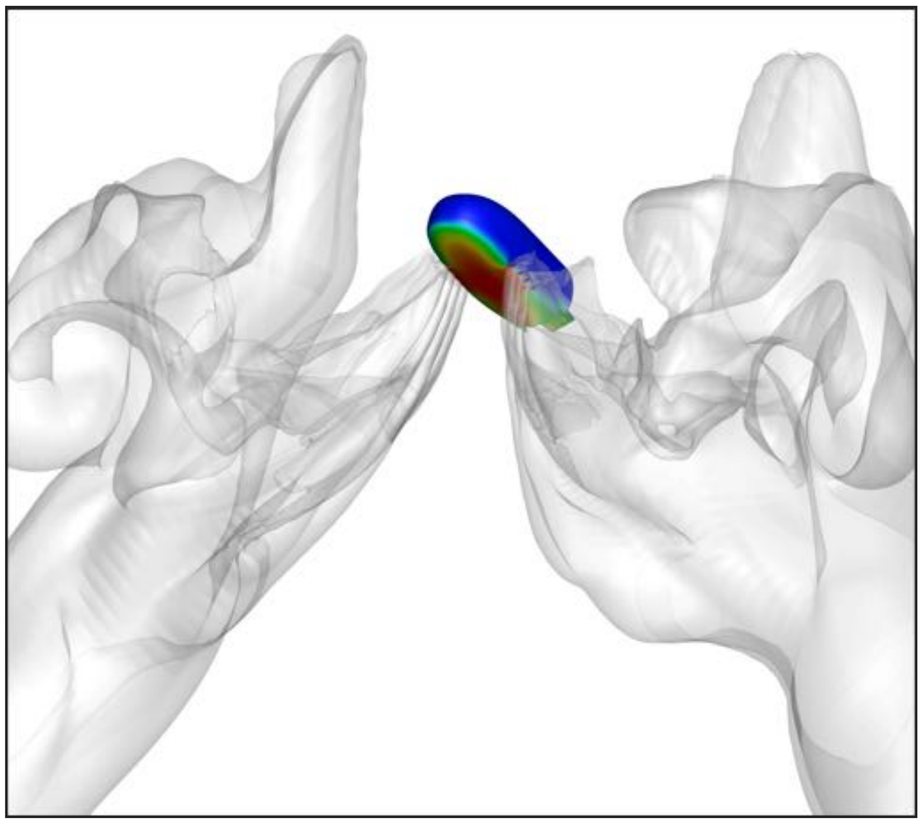


Visualization of the flow around a spacecraft with a low lift-to-drag ratio, with eight rocket engines firing to decelerate the vehicle. The surface of the vehicle is colored by pressure contours (red is high, blue is low). The simulations reveal complex interactions between the rocket plumes with the incoming flow.
Chun Tang, NASA/Ames



Flow around a spacecraft with a mid lift-to-drag-ratio, with eight rocket engines firing to decelerate the vehicle. The surface of the vehicle is colored by pressure contours (red is high, blue is low). The simulations illustrate the complicated physics of expanding rocket plumes as they interact with the supersonic freestream and change the surface pressure.
Chun Tang, NASA/Ames

National Aeronautics and Space Administration

Using Retrorockets for Human Exploration of Mars

Current entry, descent, and landing technologies used in uncrewed Mars missions are not suitable for human Mars exploration missions because they cannot be adapted for landing very heavy payloads. One solution is to use retrorockets to decelerate a spacecraft and land it directly on the planet. While the use of these "landing rockets" appears routine with the success of fly-back boosters from SpaceX and Blue Origin, more research is needed to fully understand how retropropulsion affects a vehicle's aerodynamics and heating. Computational fluid dynamics simulations run on NASA's Pleiades supercomputer are helping researchers study the complex interactions between rocket plumes and incoming flow, providing important insights for analyzing the feasibility of design concepts for future Mars missions.

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